

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 041 522 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.10.2000 Bulletin 2000/40

(51) Int. Cl.⁷: G07F 7/10, G07C 9/00

(21) Application number: 00302285.2

(22) Date of filing: 21.03.2000

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 01.04.1999 GB 9907515

(71) Applicant:
NCR INTERNATIONAL INC.
Dayton, Ohio 45479 (US)

(72) Inventor: Stanners, Anthony J.
Tokyo (JP)

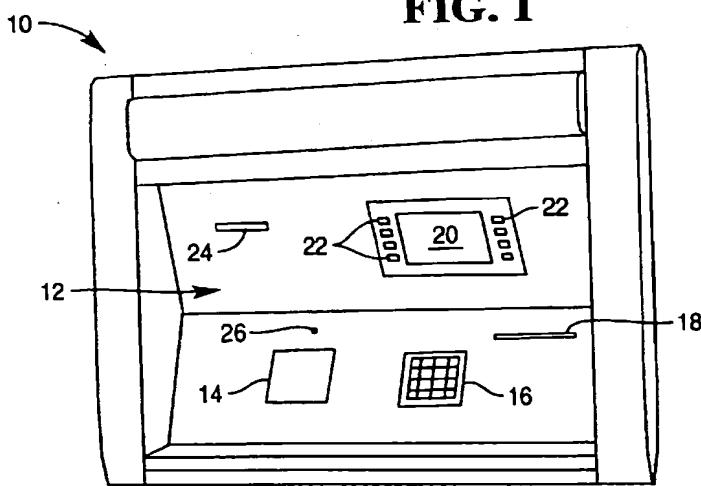
(74) Representative:
Williamson, Brian et al
International IP Department,
NCR Limited,
206 Marylebone Road
London NW1 6LY (GB)

(54) Self service terminal

(57) A self service terminal (10) including a human iris identification system is described. The iris identification system comprises a camera (30) for recording an image of a human iris via a lens (32), a processor (54) for processing the recorded image, and a plurality of visual indicators (72,74,76 or 82,84,86) associated with the lens (32) for directing a user's eye towards the lens

(32) of the camera (30), thereby enabling the camera (30) to record a clear image of the user's eye. A method of directing a user's eye towards a lens (32) of a camera (30) used in a human iris identification system is also described.

FIG. 1



EP 1 041 522 A2

Description

[0001] The present invention relates to a self service terminal (SST). In particular the invention relates to an SST including a human iris identification system.

[0002] Iris identification systems are used in SSTs such as ATMs (automated teller machines) for identifying a user of the terminal without the user having to provide an identification card.

[0003] In such a system, a user must first be enrolled. Enrolment involves obtaining an image of the iris of a user and processing this image to produce an iris signature (or code). The iris code is stored in a database of authorised users.

[0004] When an authorised user wishes to use an ATM implementing iris identification, the user looks at a camera associated with the ATM, and the camera records an image of the user's iris. This recorded image is processed to produce an iris code. The user's iris code is compared with the database of stored iris codes to find the closest match. If the closest match meets a predetermined acceptance criterion (for example, greater than a 99.999% probability of being correct) then the closest match is assumed to be the user, and the user is identified accordingly.

[0005] This system works effectively if users keep their eyes motionless and wide open so that a clear image of their iris can be obtained and recorded. Where users can be trained to use iris identification (for example where iris identification ATMs are located on military bases or on naval ships and are used by military personnel) there is generally very little problem in identifying a user. However, when iris identification ATMs are used by the general public, the ATMs may have difficulty in identifying a user because of the user's continuous head and/or eye movement.

[0006] It is an object of an embodiment of the present invention to obviate or mitigate the above problem.

[0007] According to one aspect of the invention there is provided a self service terminal including a human iris identification system, the system comprising a camera for recording an image of a human iris via a lens, and a processor for processing the recorded image, characterised by a plurality of visual indicators associated with the lens for directing a user's eye towards the lens of the camera.

[0008] It should be appreciated that the visual indicators are associated with the lens by being in general alignment with an optical axis which passes through the user's eye and the lens; for example, the visual indicators may be in registration with the axis which passes through the user's eye and the lens. It should also be appreciated that the term lens is used herein in a broad sense, to include different types of light gathering optics. A lens may include more than one optical element. The light gathering optics may deflect received light into the camera; for example, a mirror arrangement

may be used to deflect and convey light to the camera.

[0009] Each visual indicator may comprise a single indicator element at least partially surrounding the centre of the lens; alternatively, each indicator may comprise two or more indicator elements, each element being generally equidistant from the centre of the lens.

[0010] Preferably, each visual indicator is spaced from the centre of the lens by a different amount. Preferably, each visual indicator defines an axis which is coaxial with an axis through the centre of the lens.

[0011] Preferably, each visual indicator is selectively energisable, so that, in use, the indicators may be successively energised, starting with the indicator furthest from the centre of the lens and finishing with the indicator closest to the centre of the lens, thereby guiding a user's eye to the centre of the lens.

[0012] Where each visual indicator uses a single element, the element may be generally circular, and each visual indicator may have a different diameter so that the indicators are generally concentric about the centre of the lens.

[0013] The effect of the visual indicators is to provide a series of sequentially illuminated lights for guiding a user's eye towards the lens of the camera.

[0014] Preferably, the visual indicators are removed (de-energised) when the user has been identified.

[0015] In one embodiment, the colour of the visual indicators may change once identification has been established, for example from red light to green light.

[0016] The visual indicators may be permanently illuminated or they may pulsed so that they flash. As identification nears completion, the frequency of the flashing may be changed by the iris identification system. For example, the frequency of the flashing may be increased as the identification system progresses towards identifying the user.

[0017] An advantage of the invention is that as the visual indicators appear to advance towards the centre of the lens, the user's eyes are guided to the centre of the lens thereby aligning the user's iris with the camera. No previous training is required to enable a user to use this system.

[0018] According to a second aspect of the invention there is provided a human iris identification system, the system comprising a camera for recording an image of a human iris via a lens, and a processor for processing the recorded image, characterised by a plurality of visual indicators associated with the lens for directing a user's eye towards the lens of the camera.

[0019] According to a third aspect of the invention there is provided a method of directing a user's eye towards a lens of a camera used in a human iris identification system, the method characterised by the steps of: providing a plurality of visual indicators, each visual indicator being spaced from the centre of the lens by a different amount, and successively energising individual indicators starting with the indicator furthest away from the centre of the lens so that a user's eye is directed

towards the lens.

[0020] These and other aspects of the invention will become apparent from the following specific description, given by way of example, with reference to the accompanying drawings, in which:

Fig 1 is a schematic diagram of an SST incorporating an iris identification unit in accordance with an embodiment of the invention;

Fig 2 is a block diagram of the SST of Fig 1;

Fig 3 is a simplified schematic view of a typical arrangement and orientation of details of Figs 1 and 2;

Fig 4 is a schematic view of visual indicators displayed on a panel used in Fig 1; and

Fig 5 is a schematic view of alternative visual indicators displayed on a panel used in Fig 1.

[0021] Referring to Fig 1, which shows an SST 10 in the form of an ATM, the ATM 10 includes a user interface 12 which comprises: a visual indicator display 14 in the form of an LCD panel, a key pad 16 for entering transaction details, a cash dispenser slot 18 through which bank notes (valuable media) are dispensed to a user, a display screen 20 for providing transaction information to the user, additional keys (FDKs) 22 disposed at opposite sides of the screen 20 for enabling the user to select preset functions which are displayed on the screen 20 and aligned with the FDKs 22, a receipt printer slot 24 through which a receipt for a transaction may be delivered to the user, and a sensor 26 for detecting when a user is present at the ATM 10.

[0022] Fig 2 shows a block diagram of the ATM of Fig 1. Fig 2 shows a user interface module block 40 including a camera 30, the visual indicator display 14, the key pad 16, the transaction display 20, and a receipt printer module 44. The receipt printer module 44 is associated with slot 24 in the user interface 12 of the ATM 10. Fig 2 also shows a cash dispenser module 46 which is associated with the cash dispenser slot 18, and a biometrics sensing processor unit 48 which operates in association with the camera 30 to implement biometrics sensing of the user.

[0023] The ATM 10 further comprises processor means in the form of a controller unit 50 which communicates with components of the user interface module block 40, with an operator panel 52 mounted inside the ATM 10, with the cash dispenser module 46, and with the biometrics sensing processor unit 48.

[0024] The operator panel 52 contains circuitry for enabling the operator to interact with the ATM 10. Standard operator panels 52 are used on commercially available ATMs and are well known in the art. Similarly, the cash dispenser module 46 will not be described as it is a standard feature of a conventional ATM.

[0025] The controller unit 50 includes a processor unit 54 and a non-volatile memory 56. The processor unit 54 and memory 56 may be implemented by a

microcomputer having non-volatile RAM; suitable computers and memories are readily available commercially.

[0026] Fig 3 is a simplified schematic view of a typical arrangement of the camera 30, the LCD panel 14, and a user 100. The camera 30 has a lens 32 and is coupled to the controller unit 50. The camera 30 and lens 32 are oriented along an optical axis (shown by line 60) which passes through the centre area of LCD panel 14. The angle of axis 60 is selected so that it passes through the eye-level of an average height user 100. The camera 30 and lens 32 have some degree of adjustability to enable images to be recorded from users of different heights. Suitable systems comprising camera 30, lens 32, and biometrics unit 48 are available from "SENSAR" of 121 Whittendale Drive, Moorestown, New Jersey, USA 08057.

[0027] In use, when user 100 approaches ATM 10 the sensor 26 senses that a user 100 is present. This causes the display screen 20 to display text instructing the user 100 to look at LCD panel 14. Sensor 26 also causes LCD 14 to display visual indicators as shown in Fig 4.

[0028] LCD panel 14 has a transparent centre area 70 through which the camera 30 and lens 32 view the user 100; that is, the centre area 70 is the entry point for light from a user's eye. In registration with the centre area 70 are three concentric visual indicators, each having a single element. Each indicator has a centre located in the centre area 70, and has a different diameter to the other indicators.

[0029] Indicator 72 has the largest diameter and is coloured red. Indicator 74 has the smallest diameter and is coloured green. Indicator 76 has a diameter approximately mid-way between that of indicators 72 and 74, and is coloured amber.

[0030] Initially, the red indicator 72 is illuminated, shortly thereafter the amber indicator 76 is also illuminated, shortly thereafter the green 74 is also illuminated. This has the effect of guiding the user's eyes to the centre area 70 (through which axis 60 passes), thereby aiding capture of a clear image of the user's eye. The image is conveyed via controller unit 50 to the biometrics sensing unit 48 and an iris code is generated.

[0031] The controller unit 50 accesses a remote database (not shown) which compares the user's iris code with stored iris codes to identify the user 100. Various algorithms are available for processing an image of an iris to create an iris code.

[0032] Once the user 100 has been identified, the three visual indicators 72, 74, 76 are de-energised, so that the user's attention may be drawn to screen 20, where the user 100 is presented with a menu of the various transactions available at the ATM 10.

[0033] Fig 5 shows alternative visual indicators in the form of pairs of elements. Each pair of elements (for example, elements 82a,b) form a visual indicator which

is centred on area 70. When these indicators are used, the energising sequence is the same as for Fig 4, but the indicator which is furthest from the centre 70 is de-energised when a closer indicator is energised. Thus, indicator 82 (elements 82a and 82b) is energised first, then indicator 82 is de-energised and indicator 86 is energised, then indicator 86 is de-energised and indicator 84 is energised.

[0034] Various modifications may be made to the above described embodiments within the scope of the present invention, for example, the shape, colour, and configuration of the visual indicators may be changed. The time delay between energising indicators may be varied or it may depend on what stage of identification the biometrics unit has reached. Visual indicators having more than two elements per indicator may be used. The camera may be located in any convenient location, for example, on the top surface of the ATM. The LCD 14 may be incorporated into a covering for the camera 30 and lens 32; so that the camera 30, lens 32, and LCD 14 form a single unit. The function of the sensor 26 may be implemented by the camera 30. It will be appreciated that a simplified camera and lens arrangement have been illustrated, in other embodiments, much more complex optical arrangements may be used; for example, the lens may be a combination of optical elements such as mirrors and/or standard lens arrangements. If the lens deflects received light, then the optical axis will not be straight. In such an embodiment, the visual indicators associated with the lens, will be associated with the part of the lens adjacent to the entry point of light from a user's eye, that is, the point at which a user looks to have an image of his/her iris recorded. In other embodiments, the iris identification system may be used in conjunction with a user entering an identification token, such as a card, so that the iris identification system verifies the identity of the user.

Claims

1. A self service terminal (10) including a human iris identification system, the system comprising a camera (30) for recording an image of a human iris via a lens (32), and a processor (54) for processing the recorded image, characterised by a plurality of visual indicators (72, 74, 76 or 82, 84, 86) associated with the lens (32) for directing a user's eye towards the lens (32) of the camera (30).
2. A terminal according to claim 1, wherein each visual indicator (72, 74, 76) comprises a single indicator element at least partially surrounding the centre of the lens (32).
3. A terminal according to claim 2, wherein each element (72, 74, 76) is generally circular, and each visual indicator has a different diameter so that the indicators are generally concentric about the centre

of the lens (32).

4. A terminal according to claim 1, wherein each indicator (82, 84, 86) comprises two or more indicator elements (82a, b, 84a, b, 86a, b) each element being generally equidistant from the centre of the lens (32).
5. A terminal according to any preceding claim, wherein each visual indicator is selectively energisable, so that, in use, the indicators may be successively energised, starting with the indicator furthest from the centre (72 or 82) of the lens and finishing with the indicator closest to the centre (74 or 84) of the lens (32), thereby guiding a user's eye to the centre of the lens.
6. A terminal according to any preceding claim, wherein the visual indicators are pulsed so that they flash.
7. A terminal according to any preceding claim, wherein the colour of the visual indicators changes once the user has been identified.
8. A terminal according to any of claims 1 to 6, wherein the visual indicators are de-energised once the user has been identified.
9. A human iris identification system, the system comprising a camera (30) for recording an image of a human iris via a lens (32), and a processor (54) for processing the recorded image, characterised by a plurality of visual indicators (72, 74, 76 or 82, 84, 86) associated with the lens (32) for directing a user's eye towards the lens of the camera (30).
10. A method of directing a user's eye towards a lens (32) of a camera (30) used in a human iris identification system, the method characterised by the steps of: providing a plurality of visual indicators, each visual indicator being spaced from the centre of the lens by a different amount, and successively energising individual indicators starting with the indicator furthest away from the centre of the lens so that a user's eye is directed towards the lens.

FIG. 1

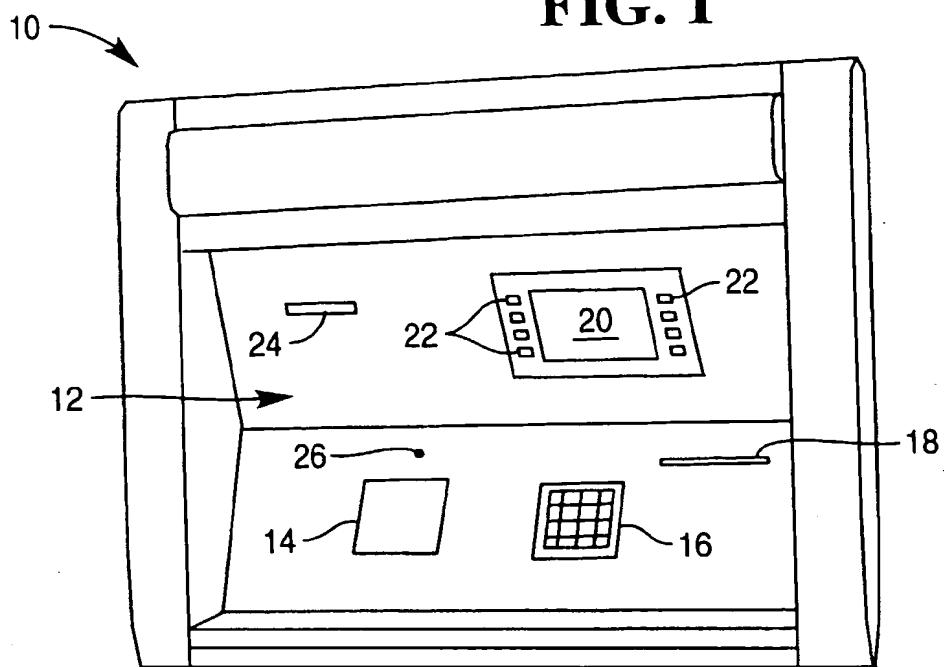


FIG. 3

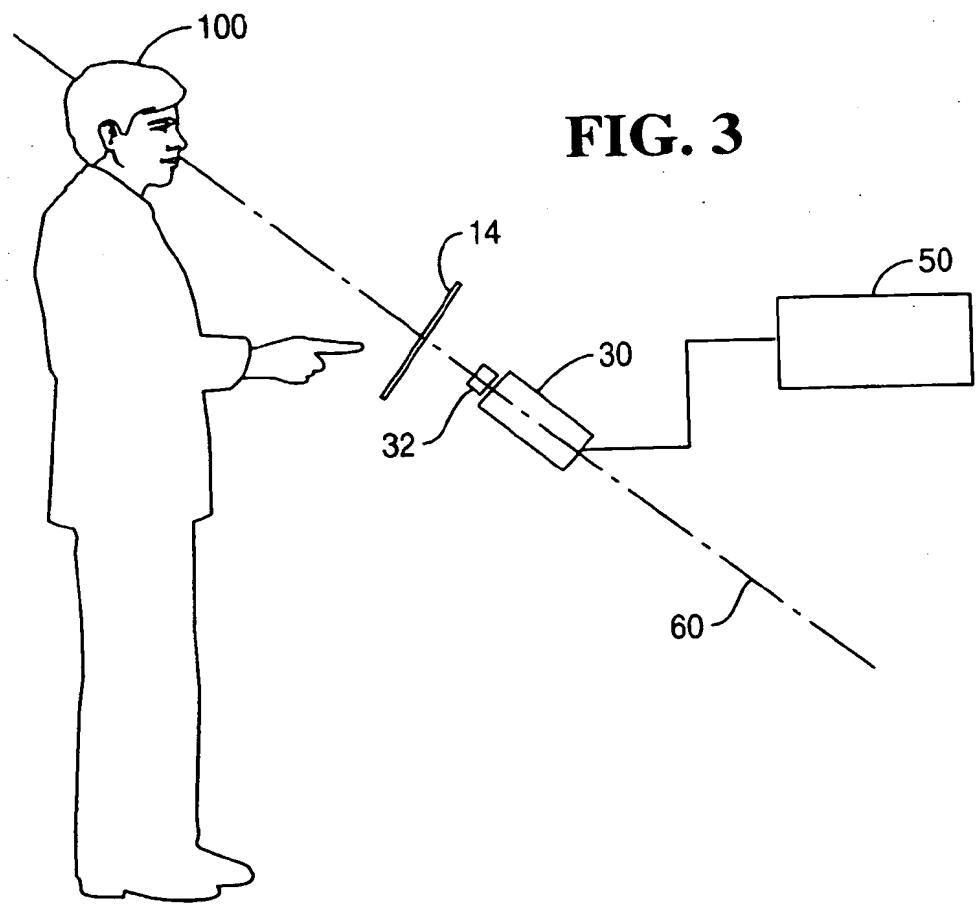


FIG. 2

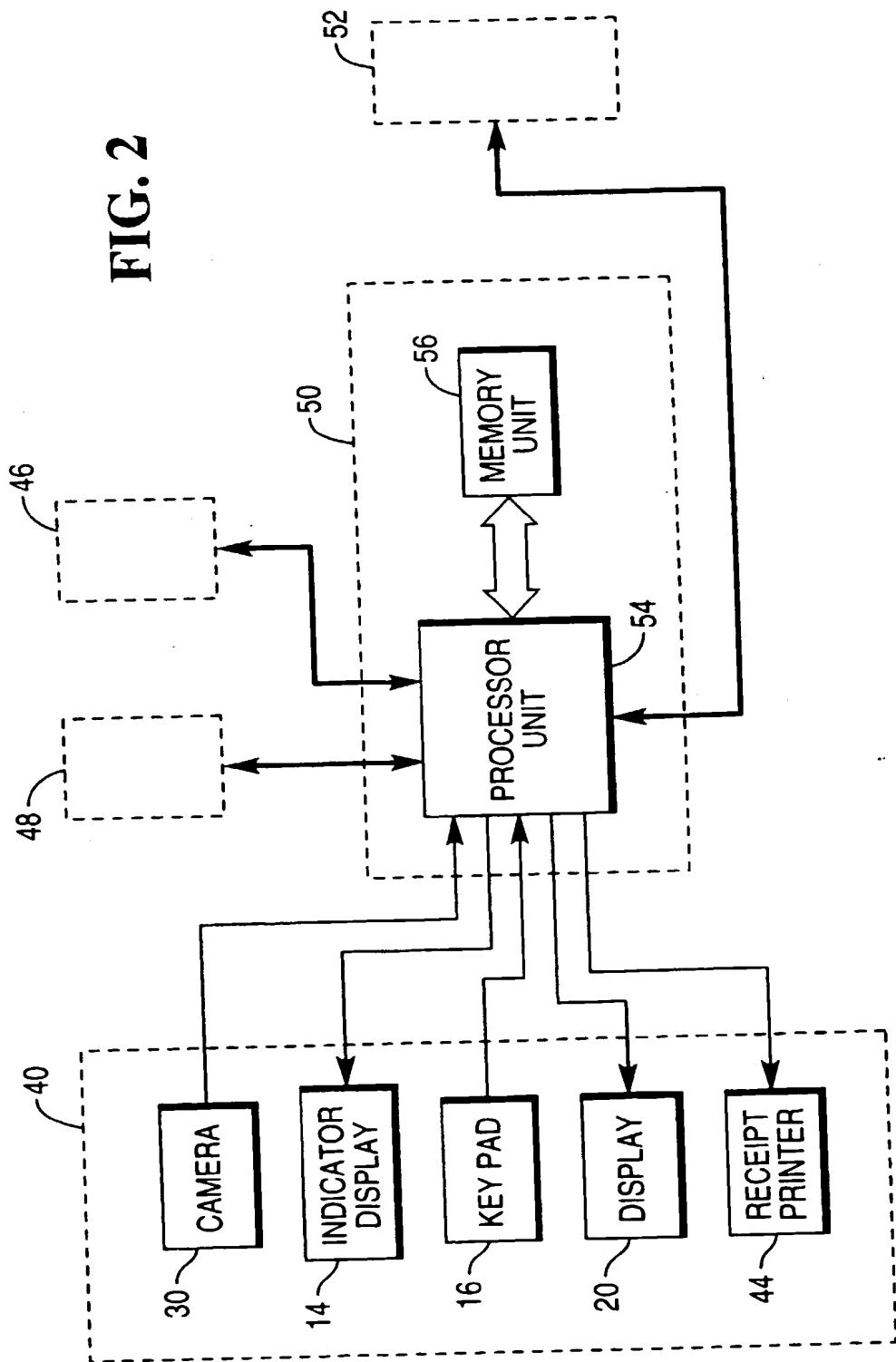


FIG. 4

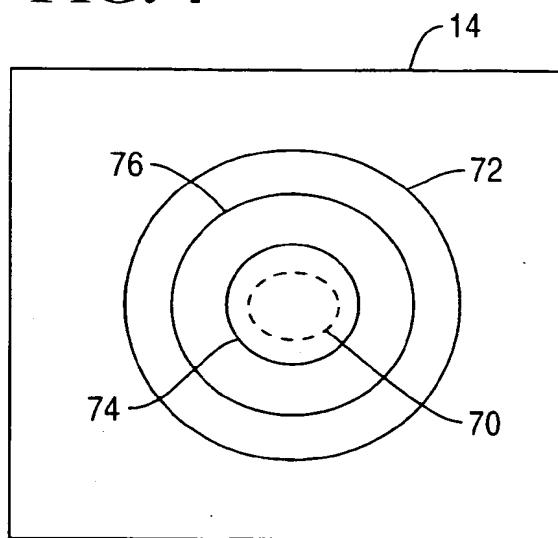
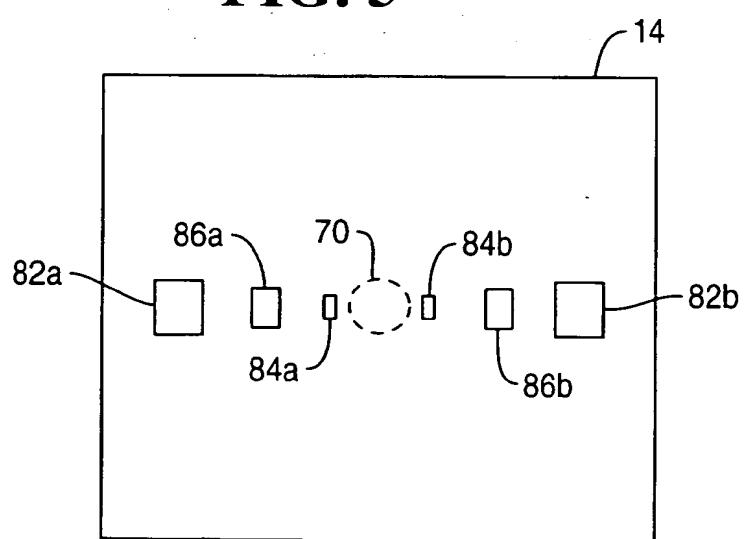


FIG. 5



(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 041 522 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
08.05.2002 Bulletin 2002/19

(51) Int Cl. 7: G07F 7/10, G07C 9/00

(43) Date of publication A2:
04.10.2000 Bulletin 2000/40

(21) Application number: 00302285.2

(22) Date of filing: 21.03.2000

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 01.04.1999 GB 9907515

(71) Applicant: NCR INTERNATIONAL INC.
Dayton, Ohio 45479 (US)

(72) Inventor: **Stanners, Anthony J.**
Tokyo (JP)

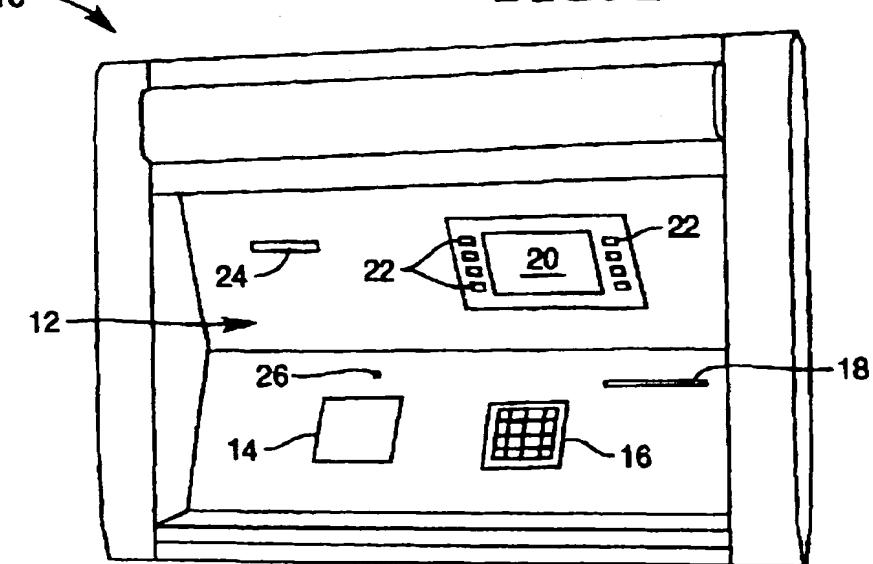
(74) Representative: **Williamson, Brian et al**
International IP Department,
NCR Limited,
206 Marylebone Road
London NW1 6LY (GB)

(54) Self service terminal

(57) A self service terminal (10) including a human iris identification system is described. The iris identification system comprises a camera (30) for recording an image of a human iris via a lens (32), a processor (54) for processing the recorded image, and a plurality of visual indicators (72,74,76 or 82,84,86) associated with the

lens (32) for directing a user's eye towards the lens (32) of the camera (30), thereby enabling the camera (30) to record a clear image of the user's eye. A method of directing a user's eye towards a lens (32) of a camera (30) used in a human iris identification system is also described.

FIG. 1





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 00 30 2285

DOCUMENTS CONSIDERED TO BE RELEVANT		Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Category	Citation of document with indication, where appropriate, of relevant passages		
Y	WO 97 21188 A (DAVID SARNOFF RESEARCH CENTER, INC.) 12 June 1997 (1997-06-12)	1-4,9	G07F7/10 G07C9/00
A	* page 4, line 15 - page 5, line 25 * * page 15, line 5 - line 14 * * page 23, line 6 - line 35 * * page 56, line 6 - page 57, line 19; figures 1-5E,,21A-21B *	5-8,10	
Y	WO 90 01291 A (ANGI, M.) 22 February 1990 (1990-02-22)	1-4,9	
A	* page 3, line 5 - line 8 * * page 4, line 14 - line 17 * * page 5, line 21 - page 6, line 14; claim 6; figures 1-3 *	5-8,10	
A	US 4 641 349 A (FLOM ET AL) 3 February 1987 (1987-02-03) * column 10, line 29 - line 55; figure 11 *	1-4,9,10	
A	WO 98 08439 A (SENSAR, INC.) 5 March 1998 (1998-03-05) * page 13, line 12 - line 21; claim 1; figures 1-5 *	1-4,9,10	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	WO 97 46978 A (BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY) 11 December 1997 (1997-12-11) * page 1, line 32 - page 2, line 21.* * page 4, line 16 - page 6, line 27 * * page 10, line 11 - page 16, line 33; figures 1-6 *	1,9,10	G07F G07C A61B G06K
A	US 5 751 836 A (WILDES ET AL.) 12 May 1998 (1998-05-12) * column 3, line 11 - line 67; figures 1-3 *	1,9,10	
		-/-	
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	18 March 2002	Rivero, C	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document	
X : particularly relevant if taken alone			
Y : particularly relevant if combined with another document of the same category			
A : technological background			
O : non-written disclosure			
P : intermediate document			



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 00 30 2285

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.7)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
A,P	US 5 956 122 A (DOSTER) 21 September 1999 (1999-09-21) * column 3, line 42 - column 6, line 41; figures 1-6 *	1,9,10							
A	WO 99 06928 A (SPRING TECHNOLOGIES, INC.) 11 February 1999 (1999-02-11) * page 6, line 4 - line 12 * * page 25, line 17 - page 26, line 11; figures 1A-1B,8A-8C *	1,9,10							
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>18 March 2002</td> <td>Rivero, C</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	18 March 2002	Rivero, C
Place of search	Date of completion of the search	Examiner							
THE HAGUE	18 March 2002	Rivero, C							
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document							
<small> EPO FORM 1502.02/2 (P4/C01) X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document </small>									

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 2285

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EPO file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-03-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 9721188	A	12-06-1997	AU EP WO	1127197 A 0865637 A1 9721188 A1	27-06-1997 23-09-1998 12-06-1997
WO 9001291	A	22-02-1990	IT AU WO	1226526 B 3977989 A 9001291 A1	24-01-1991 05-03-1990 22-02-1990
US 4641349	A	03-02-1987	AT BR CA DE EP IL JP JP MX WO	65851 T 8605561 A 1244552 A1 3680618 D1 0215818 A1 77920 A 5084166 B 62501889 T 163339 A 8605018 A1	15-08-1991 22-04-1987 08-11-1988 05-09-1991 01-04-1987 30-06-1989 01-12-1993 30-07-1987 24-04-1992 28-08-1986
WO 9808439	A	05-03-1998	AU EP WO	727389 B2 4328297 A 0959769 A1 9808439 A1	14-12-2000 19-03-1998 01-12-1999 05-03-1998
WO 9746978	A	11-12-1997	EP AU AU AU CN CN EP EP WO WO WO JP JP JP US US	0872814 A1 3039297 A 3039397 A 3039497 A 1221503 A 1221504 A 0922271 A1 0910836 A1 0909431 A1 9746978 A1 9746979 A1 9746980 A1 2000512167 T 2000512168 T 2000512169 T 6309069 B1 6333988 B1	21-10-1998 05-01-1998 05-01-1998 05-01-1998 30-06-1999 30-06-1999 16-06-1999 28-04-1999 21-04-1999 11-12-1997 11-12-1997 11-12-1997 19-09-2000 19-09-2000 19-09-2000 30-10-2001 25-12-2001
US 5751836	A	12-05-1998	US AU AU AU	5572596 A 719428 B2 1318799 A 702883 B2	05-11-1996 11-05-2000 18-03-1999 11-03-1999

EPO FORM P0458
For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 2285

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-03-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5751836	A		AU	3419895 A	27-03-1996
			BR	9508691 A	06-01-1998
			CA	2199040 A1	14-03-1996
			CN	1160446 A	24-09-1997
			EP	1126403 A2	22-08-2001
			EP	0793833 A1	10-09-1997
			HU	76950 A2	28-01-1998
			JP	10505180 T	19-05-1998
			WO	9607978 A1	14-03-1996
US 5956122	A	21-09-1999	WO	0000079 A1	06-01-2000
WO 9906928	A	11-02-1999	US	6119096 A	12-09-2000
			AU	730215 B2	01-03-2001
			AU	7123198 A	22-02-1999
			AU	8763398 A	22-02-1999
			BR	9815555 A	17-07-2001
			CA	2302277 A1	11-02-1999
			EP	1029298 A1	23-08-2000
			JP	2001512262 T	21-08-2001
			WO	9906928 A1	11-02-1999
			WO	9906901 A2	11-02-1999